National Aeronautics and Space Administration

Commercial Crew Initiative Overview and Status

NASA Exploration Systems Mission Directorate

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All information contained in this briefing is for planning purposes only. NASA reserves the right to make any changes to these plans in the future.

The Future State

- The vision of commercial human spaceflight to Low Earth Orbit (LEO) is a robust, vibrant, profit-making commercial enterprise with many providers and a wide range of private and public users.
- A successful human space transportation system will: strengthen the ISS Program, allow NASA to focus on beyond LEO exploration, potentially reduce the cost of human access to space, and significantly contribute to the National economy.
- NASA's commercial crew initiative will be the next, major step in making this vision a reality.

Commercial Crew

	2011	2012	2013	2014	2015
Commercial Crew	$500	$1,400	$1,400	$1,300	$1,200

- The FY 2011 budget request invests $6 billion over five years to spur development of U.S. commercial human spaceflight vehicles.
  - Support potential commercial crew transportation providers to whom NASA could ultimately award a competitive crew transportation services contract.
  - Important development considerations include human rating existing vehicles, development of capsules that can fly on multiple launch vehicles, and/or developing new high-reliability rocket systems.
- NASA plans to competitively allocate commercial crew funds to support higher and lower risk systems and systems components.
  - NASA will ensure that all commercial systems meet stringent human-rating and safety requirements before we allow any NASA crew member to travel aboard a commercial vehicle.
  - NASA will work with the private sector to get the broadest range of competitors, from established aerospace companies to emerging companies.

Objectives and Approach

- The objective of the proposed commercial crew initiative is to facilitate the development of a U.S. commercial crew space transportation capability with the goal of achieving safe, reliable, and cost effective access to and from LEO and the ISS. Once the capability is matured and expected to be available to the Government and other customers, NASA could purchase commercial services to meet its ISS crew transportation needs.
- Preliminary Approach:
  - Competition through pre-negotiated, milestone-based agreements that support the development, testing, and demonstration of multiple systems.
  - Support an end-to-end transportation solution that will encourage the development of a range of launch vehicle and spacecraft combinations.
  - Industry investment capital will be included as part of any agreement.
  - Clearly and promptly state NASA's safety requirements and ensure that they are met.
  - Lead to the competitive selection of one or more commercial service providers with the goal of awarding firm fixed price contract(s).

Framework

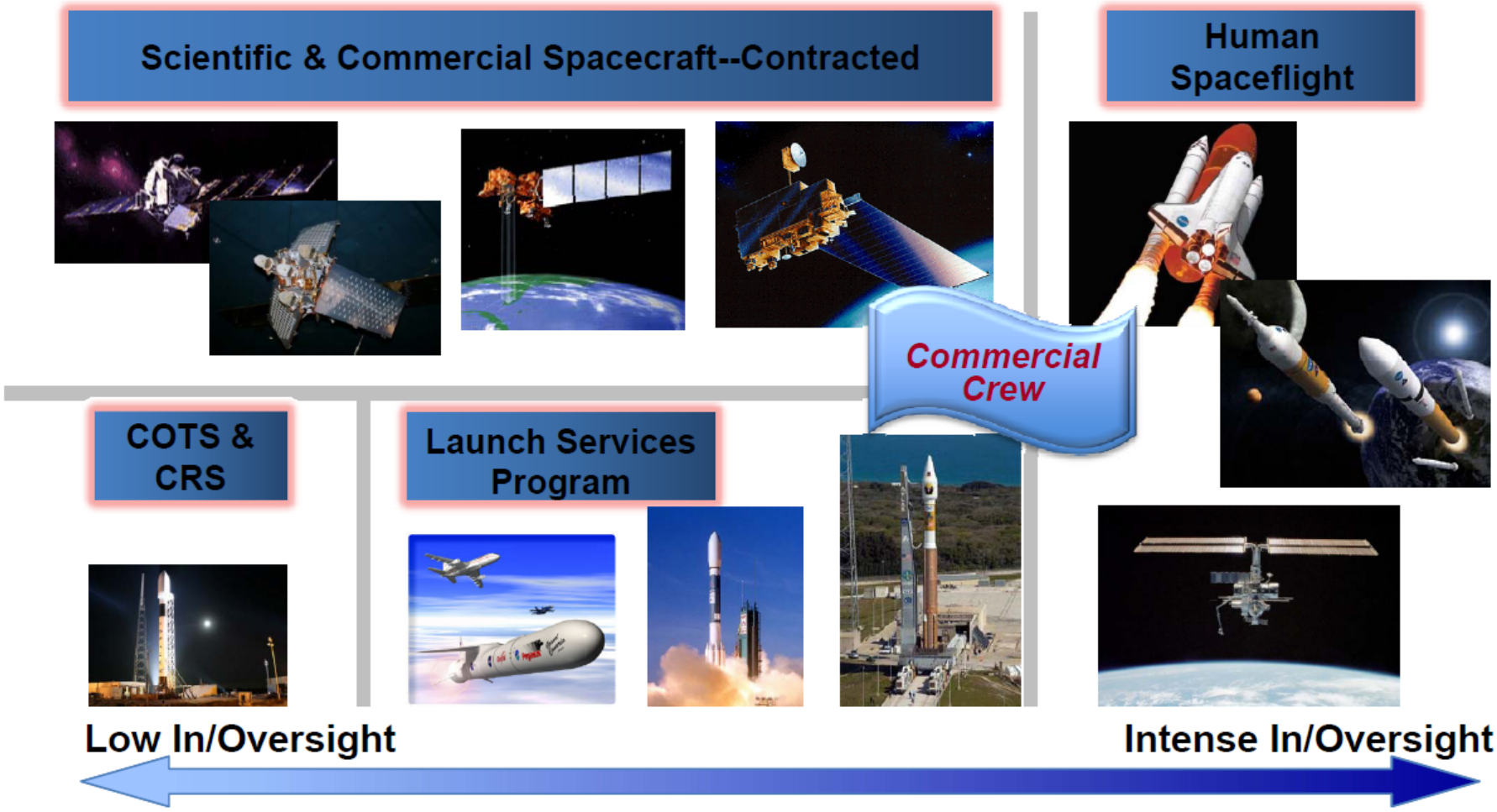
- The framework should be designed to achieve both program goals:
  - Safe transport of U.S. and U.S.-designated astronauts to and from ISS.
  - Support the development of non-NASA markets for commercial human transportation services to and from LEO.

- Given this, the framework should:
  - Accommodate a diversity of people (e.g., astronauts, international partner personnel, scientists, spaceflight participants) for a variety of reasons (e.g., science, research, station operations, tourism), including NASA personnel as crew or participants.
  - Incorporate requirements and a concept of operations that are as high-level as possible, providing commercial providers with maximum flexibility to propose a variety of safe and cost effective system solutions.
  - Rely on NASA human spaceflight certification for ISS crew transportation missions.
  - Eventual state will be Federal Aviation Administration licensing with NASA human spaceflight certification and technical mission assurance oversight.

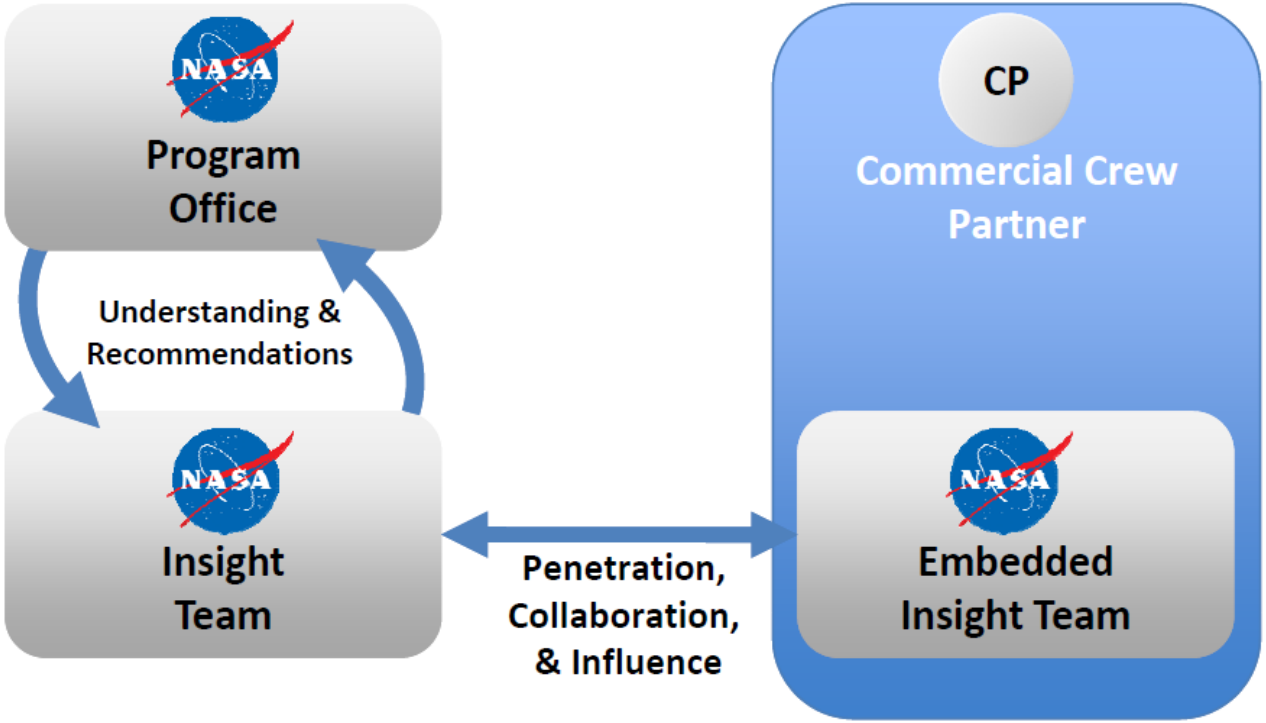
Insight / Oversight Approach

- The insight/oversight approach envisioned will require a change in the way government and industry interact for human spaceflight missions.
  - There will be a stronger reliance on the commercial providers to develop a safe, reliable vehicle.
  - NASA will have in-depth insight of the vehicle design through NASA personnel who are embedded in the contractor's facility.
  - A key facet of certifying the vehicle system will be through the use of requirements and standards. These will be imposed on all the providers and NASA will ensure that these are properly tailored.
  - The insight approach should be more efficient, more penetrating, provide more insight and can provide a more reliable system than an approach that embraces the review of contract deliverables and requirements accounting.
  - This approach has been highly effective in the past in ensuring reliable high-valued launch vehicle/payloads and robotic spacecraft.

Insight / Oversight Approach (cont.)



Team Roles



Embedded team represents the long term presence with the CP developing interpersonal relationships and trust to yield significantly greater insight.

ISS Program Goals

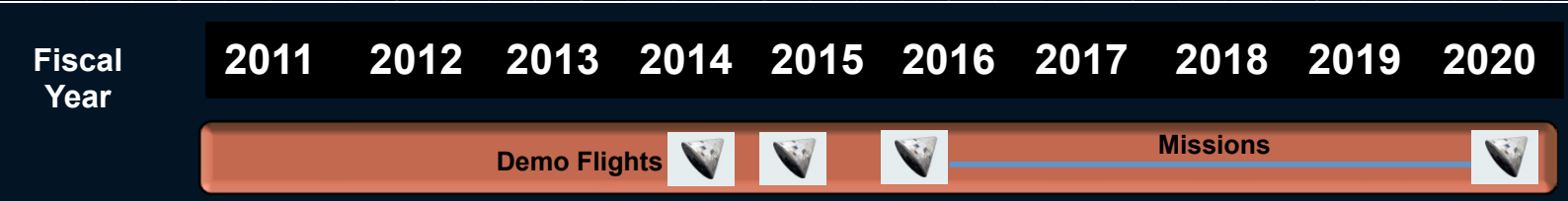
- The requirements development process was guided by experience with core services provided by Soyuz, lessons learned from prior NASA development programs (such as the Constellation Program, Orbital Space Plane, and X-38), and feedback from industry during the Commercial Orbital Transportation Services (COTS) and Commercial Crew Development (CCDev) activities.
- Key program requirements may include:
  - Safe transit for up to four ISS crewmembers
  - At least two flights per year
  - Targeted availability of 2015
  - Safe abort and crew recovery for all phases of launch and ascent, including pad escape
  - ISS visiting vehicle requirements
  - ISS physical and environmental interface definitions and requirements
  - NASA is currently evaluating the use of commercial vehicles for assured crew return capability

Concept of Operations

- The conops is intentionally high-level and general, thereby providing commercial partners maximum flexibility to propose innovative and cost effective solutions.
- Commercial partners will generally be responsible for all management, engineering, production, logistics, testing and verification, launch preparations, mission planning, integration, training, and operational functions.

- Commercial partners will generally be responsible for all facilities and infrastructure; however, government resources can be made available to commercial providers, if requested, through reimbursable agreements.
- Commercial partners will be responsible for providing Certification of Flight Readiness (CoFR) for the vehicle and all ground and flight support infrastructure to NASA for acceptance.

Timeline



- Using previous industry inputs assuming a non-traditional acquisition, funding multiple commercial partners is feasible.
  - Cost estimates using traditional techniques indicate $5 billion-$10 billion required for *one* provider.
  - Competition among multiple commercial partners is a fundamental aspect of the strategy: incentivizes performance, supports cost effectiveness, and does not leave NASA dependent on a single provider even if a provider drops out or is terminated.
- Baseline plan reflects success-oriented schedule to enable services capability by late 2015 (assumes early FY2011 authorization to proceed).
- NASA will readjust its plans to be consistent with Congressional direction provided in FY 2011 authorization and appropriations laws, including Continuing Resolution(s).

Summary

- The commercial crew initiative is designed to meet the objectives of satisfying NASA's ISS crew transportation needs and enable the growth of a commercial human space flight industry for use by NASA and other customers.
- If approved by Congress, the commercial crew initiative will represent a new way of doing business in human spaceflight, and it will be well grounded by:
  - Knowledge gained from prior programs.
  - Thorough human spaceflight certification processes.
  - Building on the successes of Commercial Orbital Transportation Services (COTS), Commercial Resupply Services and Commercial Crew Development (CCDEV) activities.
- If successful, the commercial crew initiative will:
  - Transform human spaceflight for future generations.
  - Result in safe, reliable, cost effective crew transportation for the ISS.
  - Free NASA's limited resources for beyond-LEO capabilities.
  - Reduce reliance on foreign systems.
  - Lower the cost of access to space, enhance the U.S. industrial base, and act as a catalyst for the development of other space markets.